ASCEND CLIMBING POLE ROBOT

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This report is submitted in partial fulfillment of the award of Bachelor of Electronic Engineering (Telecommunication Electronics) With Honours

Faculty of Electronic and Computer Engineering

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Tajuk Projek : ASCENDS CLIMBING POLE ROBOT

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This thesis is dedicated to my father and mother for their sacrifice towards my success; it is also dedicated to my supervisor, Mr Ridza Azri, who taught me that even the largest task can be accomplished if it is done one step at a time.

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ABSTRACT

In this project, we present the controlling of an Ascend Climbing Pole Robot by using Visual Basic Interfacing which has the capability to climb up and down the pole. The initial idea of this project is to facilitate human work and help reduce the dangerous risks among workers. Where, availability of robots having the ability to move vertical surfaces is useful when a task requires the use of far reaching tools or is risky if carried out by human. Resulting design consist of triangular body with equal sides and limbs are connected at it corner point with ordinary wheels at their tips. The execution of robot is through the Visual Basic Interfacing and connected using the radio frequency (RF) two channels to control the robot using wireless connection. The ability of robot to climb in the rate of 22 seconds over the length of 42cm is suitable based on a pole. The contributions of this project can simplify many human tasks.

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ABSTRAK

Dalam projek ini, kami mempersembahkan pengawalan Ascend Climbing Pole Robot dengan menggunakan perantaramuka Visual Basic yang memiliki kemampuan untuk naik dan turun tiang. Idea awal dari projek ini adalah untuk mempermudah pekerjaan manusia dan membantu mengurangkan risiko yang berbahaya di kalangan pekerja. Dimana, keupayaan robot memiliki kemampuan untuk mendaki pada permukaan menegak memberi kegunaan untuk suatu tugas yang memerlukan penggunaan alat yang mencapai pada ketinggian atau berisiko jika dilakukan oleh manusia. Keputusan rekabentuk terdiri dari badan segitiga dengan sisi yang sama dan anggota tubuh menyambung pada satu titik sudut dengan roda biasa di hujung mereka. Perlaksanaan robot adalah melalui perantaramuka Visual Basic dan disambungkan menggunakan RF dua saluran untuk mengawal robot menggunakan sambungan wayarles. Kemampuan robot untuk mendaki dalam masa 22 saat pada kepanjangan 42cm adalah berpadanan berdasarkan tiang. Sumbangan projek ini boleh menyederhanakan banyak tugas manusia.

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CONTENTS

CHAPTER	DESCRIPTION	PAGE
	PROJECT TITLE	**i**
	VERIFYING FORM	**ii**
	DECLARATION	**iii**
	SUPERVISOR APPROVAL	**iv**
	DEDICATION	**v**
	ACKNOWLEDGEMENT	**vi**
	ABSTRACT	**vii**
	ABSTRAK	**viii**
	CONTENTS	**ix**
	LIST OF TABLES	**xiii**
	LIST OF FIGURES	**xiv**
	LIST OF APPENDICES	**xvi**

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I	**INTRODUCTION**		
	1.0	Introduction	1
	1.1	Objectives	3
	1.2	Problem statement	3
	1.3	Scope of work	3
II	**LITERATURE REVIEW**		
	2.0	Introduction	5
	2.1	Related work	6
	2.2	Visual Basic	7
	2.3	Serial Port RS 232	9
		2.3.1 PC serial port pin out explanations	10
		2.3.2 RS232 data flow diagram	11
		2.3.3 RS-232 specifications	12
	2.4	Peripheral Interface Controller (PIC)	13
	2.5	RF Transmitter Module	14
		2.5.1 Product Specification	15
	2.6	RF Receiver Module	16
		2.6.1 Product Specification	16
	2.7	MAX 232	17
		2.7.1 Voltage level	18
		2.7.2 Product Specification	19
	2.8	Motor Driver L298	19
		2.8.1 Product Features and Specifications	21
		2.8.2 Motor Driver L298 operation	21
	2.9	DC Motor	22
	2.10	Torque	24

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	2.10.1	Calculating Torque in a Geared System	26
	2.11	Spring	27
		2.11.1 Spring Geometry	28
	2.12	Climbing Fundamentals	29
	2.13	Fundamental of Taking Surface	30
		2.13.1 Suction	31
		2.13.2 Magnetic Forces	31
		2.13.3 Gripping By Limbs	32
		2.13.4 Van Der Waals Force	32
	2.14	Robot Mechanism	33
	2.15	Architecture	35
		2.15.1 Interfacing	36
		2.15.2 Robot Assembling	37
III	**PROJECT METHODOLOGY**		
	3.0	Introduction	38
	3.1	Planning Flow Chart and project planning using Gant Chart	38
		3.1.1 Gant Chart	39
		3.1.2 Flow Chart	40
	3.2	Identify Project Title	41
	3.3	Collecting Project Information	41
	3.4	Information Searching	41
		3.4.1 Books	42
		3.4.2 Journals and Articles	42
		3.4.3 Internet and Web Pages	42
		3.4.4 Discussion with lecturer	42
	3.5	Create, Understand Project Circuit and Programming	43
	3.6	Selecting Projects Component	43
	3.7	Circuit Testing	43
	3.8	Design Process	43

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	3.9	Block Diagram	44
IV	**RESULT AND ANALYSIS**		
	4.0	Introduction	45
	4.1	Process	45
	4.2	Circuit Schematic	50
		4.2.1 Transmitter circuit	50
		4.2.2 Receiver Circuit	52
		4.2.3 Motor Driver L298	54
	4.3	Construction process	56
	4.4	PIC 16F877A Source Code	59
	4.5	Visual Basic Source Code	66
	4.6	Analysis and Discussion	72
V	**CONCLUSION AND SUGGESTIONS**		
	5.0	Introduction	73
	5.1	Conclusion	73
	5.2	Suggestions	74
	REFERENCES		**75**

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LIST OF TABLES

NO	DESCRIPTION	PAGES
Table 2.1	The RS 232 specification	12
Table 2.2	Type TX 315/433 MHz	14
Table 2.3	RF_TX_315 and RF_TX_433 Specifications	15
Table 2.4	RF Receiver Modules 315MHz or 433MHz	16
Table 2.5	RF_RX_315 and RF_RX_433 specifications	17
Table 2.6	Voltage levels	18
Table 4.1	The measurement of climbing speed in forward movement	46
Table 4.2	Differences before and after modification	72

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LIST OF FIGURES

NO	DESCRIPTION	PAGES
Figure 1.1	The Visual Basic interfacing and connection to the PIC	4
Figure 2.1	Visual Basic	7
Figure 2.2	Interfacing using Visual Basic	8
Figure 2.3	Serial port RS 232	9
Figure 2.4	Serial port RS 232 pin diagram	9
Figure 2.5	Data flow diagram	11
Figure 2.6	PIC16F877A pin- diagram and basic connection	13
Figure 2.7	Max 232 pin diagram	17
Figure 2.8	Max232 Connection	18
Figure 2.9	Microcontroller control of motor driver	20
Figure 2.10	Logic table of operation	22
Figure 2.11	10 rpm DC gear motor	23
Figure 2.12	The wheel rotation	24
Figure 2.13	The dimension of torque	25
Figure 2.14	Motor torques in geared system	26
Figure 2.15	Spring Geometry of Extension springs	28
Figure 2.16	A single wheel mechanism	33

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Figure 2.17	A schematic view of climbing mechanism	34
Figure 2.18	Side View and Top View of Ascend Climbing Pole Robot	34
Figure 2.19	Wheels	35
Figure 2.20	Ascend Climbing Pole Robot architecture	35
Figure 2.21	The Visual Basic control panel	37
Figure 3.1	Gant Chart	39
Figure 3.2	Flow chart of implementation planning	40
Figure 3.3	The block diagram of Ascend Climbing Pole Robot	44
Figure 4.1	Graph shown the movement of robot in time and distance for Forward movement	47
Figure 4.2	Graph shown the climbing speed in time and distances separates by the value of ranges	47
Figure 4.3	Figure shown the movement of robot in time and distance every 2seconds from 0seconds until 22 seconds	48
Figure 4.4	The Visual Basic control panel	49
Figure 4.5	Transmitter circuit schematic	50
Figure 4.6	Transmitter PCB track design	51
Figure 4.7	Transmitters Schematic Printed	51
Figure 4.8	Receiver Circuit Schematic	52
Figure 4.9	Receiver PCB track design	53
Figure 4.10	Receivers Schematic Printed	53
Figure 4.11	Motor Driver L298 Circuit schematic	54
Figure 4.12	L298 PCB track design	55
Figure 4.13	L298 Schematic Printed	55
Figure 4.14	Transmitter circuit (upside view)	56
Figure 4.15	Transmitter circuit (downside view)	56
Figure 4.16	Receiver circuit (upside view)	57
Figure 4.17	Receiver circuit (downside view)	57
Figure 4.18	L298 circuit (upside view)	58
Figure 4.19	L298 circuit (downside view)	58

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LIST OF APPENDICES

NO	DESCRIPTION	PAGES
Appendix A	Technical Paper Development of Automatic Self Balancing Control System For a Tree Climbing Robot	77
Appendix B	DC Motor	81
Appendix C	Torque	86

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CHAPTER 1

INTRODUCTION

1.0 Introduction

An increasing interest in the development of special climbing robots has been witnessed in last decade. Motivations are typically to increase the operation efficiency in dangerous environments or difficult-to-access places, and to protect human health and safety in hazardous tasks. Climbing robots with the ability to maneuver on vertical surfaces are currently being strongly requested by various industries and military authorities in order to perform dangerous operations such as inspection of high-rise buildings spray painting and sand blasting of gas tanks, maintenance of nuclear facilities, aircraft inspection, surveillance and reconnaissance, assistance in fire fighting and rescue operations. Such capabilities of climbing robots would not only allow them to replace human workers in those dangerous duties but also eliminate costly scaffolding.

Climbing robots are useful when a task requires the use of far reaching tools or is risky if carried out by humans. Availability of robots having the ability to move vertical surfaces would simplify many human tasks. Most climbing robot described

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In the literature is a surface climber and must adhere to the surface. Climbing pole robot was built to climb up and down a pole. The parameters that effect the operation and stability of this robot for the climbing up and sliding down motion include the weight of various components, dimensions of linkages, angles of inclination, spring constants, clearances and coefficients of friction between the pole and gripping arms, also climbing speed.[3]

Moreover, some new and important tasks for climbing robots can be introduced. Cleaning electric lights on lampposts in highways is one of these new tasks. Air pollution in metropolitan areas is the main cause of dirt on highway light bulbs. Therefore, the highway lighting systems should be cleaned on regular bases in order to have the required light in the highways without resorting to more powerful and energy consuming lighting systems. Manual cleaning of highway lighting systems is a very dangerous and traffic disturbing task [1, 2]

Based on existing robot and the natural and artificial climbing mechanisms had been studied and the design of Ascend Climbing Pole Robot is described. In this project, we had developed the climbing robot that can be control up and down by using Visual Basic interfacing. The visual basic will send the data to the microcontroller at the Transmitter circuit that was connected by using serial port RS232. Then the data from transmitter will transmit to the receiver and this make the connection as a wireless connection. The microcontroller at the receiver will receive the data to make a connection to the motor driver l298 to drive the motor forward and backward simultaneously move the lower wheels which actuated to dc motor and robot will climb up and down at the pole. These robots also can be equipped with video cameras, microphones, other sensors, and robotic manipulators to perform certain tasks. With the existence of Climbing Pole Robot, the safety of worker can be solved properly.

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1.1 Objective

The main objective of this project is to introducing the Ascends Climbing Pole Robot assembling by using Visual Basic Interfacing. Referred to previous researcher most likely used the remote as the controller to control their robot. But in this project, visual basic has been used to control as interfacing. Another objective is to design and develop pole climbing pole robot that has ability to climb on the pole vertically. The ability this robot to climb up and down vertically could simplify human task which need they to reach something at the high pole. Next objective is to ensure that the robot can climb smoothly and stable over the pole.

1.2 Problem Statement

The electrical problems in high places will endanger lives because they do not know what is happening in these places because not be monitored as they may occurs a short circuit and other electrical problems. In addition, air pollution in metropolitan areas is the main cause of dirt on highway light bulbs. Therefore, the highway lighting systems should be cleaned on regular bases in order to have the required light in the highways without resorting to more powerful and energy efficient lighting consumes. Manual cleaning of highway lighting systems is a very dangerous and interferes with traffic duties. In related robots and the natural and artificial climbing mechanisms are reviewed and the design of the Ascends Climbing Pole Robot is described.

1.3 Scope of work

This scope of this project is to design the robot which has the capability to climb up and down the pole by using the Visual Basic interfacing. This project can be divided into three parts which is mechanical part where the analysis about the torque load carry, spring constant consists of the do and the stability of robot to climb at any pole and any shapes of pole. Then, electronic part where consists of the transmitter and receiver circuit also motor driver circuit to control the rotation of the gear motor forward or reverse direction. The circuits are constructed and test to

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ensure it was function. Another scope of work is by develop Visual Basic Interfacing that including the source code needs to be run and drive up the robot from personal computer (Pc). This interfacing is connected to the PIC circuit through the serial port RS 232.

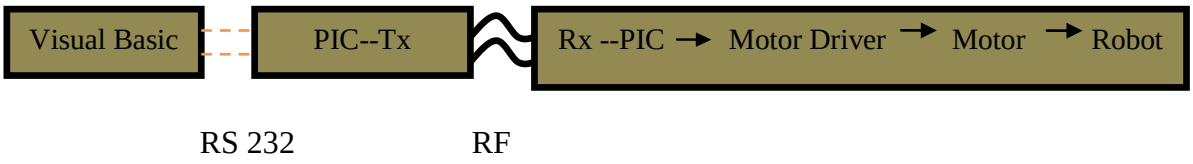

Figure 1.1: The Visual Basic interfacing and connection to the PIC

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CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this chapter will explain in detail about the research literature. Some concept of a project is described. This is because an understanding of the work will assist in preparing project end of this year.

Literature study phase is to describe all processes that occur in doing a project such as search, data collection and analysis of what has been found. All processes will be done through the resources available from books, journals, technical reports, forums, websites and others. Its main purpose is to acquire knowledge and ideas about topics that have been issued and knows the strength and weaknesses of a study of the literature.

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2.1 Related Work

The climbing mechanism is generally based on suction cups and magnetic ends, which require smooth or metallic ferrous surfaces respectively. Other robot have been designed for special situations, for example type of pole climbing robot is using grippers as the robot hands and legs where the robots use the grippers to climb the pole objects. Most of the robot is created by using pneumatic system to control the grippers and the movement of the robot. This because the pneumatic system can grip tighter on the pole objects compare by using DC motor or servo motor as the gripper. But this type of robot needs an air compressor to make it functioning. The movement of the robot also limit by the length of air cables. If the robot needs to climb tall pole objects, the robot need long air cables. The movement also limit by the weight of the robot because the component for pneumatic system is heavy compare to the robot that using aluminums and electronic components [4].

Other types of robot are snake climbing robot. This climbing robot is designed like a snake and used the nanotechnology as its skin. Then, the movement of this robot is quite similarly like the movement of a snake while climbing a tree. However, the cost to create this cylinder climbing robot is very expensive since it is not commercially in use yet [4].

However in most of the climbing robot, this project is the best produced and recorded many advantages over other designs, where it uses six wheels to climb the pole. The three upper limbs only serve to increase the stability of the robot and act as a supporter to the three lower wheels. It also improves the grasp of the robot on the pole. Each limb is connected with a separate extension spring to the body, which tend to bring the limbs into the body plane. The wheels on the lower limbs are actuated with DC motors, while the ones on the top limbs are not actuated and act as a guide for the robot. Basically in applications which the robot should climb an object other than a flat surface, it needs limbs and grippers to grasp the object and climb up. It depending on the application a variety of implementations is possible for the limb and gripper mechanisms

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In addition, the wheels on these limbs should not add any constraints to the motion of the robot. Moreover it can be assumed that the forces exerted by the springs produce large enough normal components to bring the lower wheels in good contact with the surface of the pole so that the wheels do not slip [5].

2.2 Visual Basic

Visual Basic (VB) is the third-generation event-driven programming language and integrated development environment (IDE) from Microsoft for its COM programming model. Visual Basic was derived from BASIC and enables the rapid application development (RAD) of graphical user interface (GUI) applications, access to databases using Data Access Objects, Remote Data Objects, ActiveX Data Objects, and creation of ActiveX controls and objects. [13].

Forms are created using drag and drop techniques. A tool is used to place controls for examples, text boxes, and buttons, on the form (window). Controls have attributes and event handlers associated with them. Default values are provided when the control is created, but may be changed by the programmer. Many attribute values can be modified during run time based on user actions or changes in the environment, providing a dynamic application. For example, code can be inserted into the form resize event handler to reposition a control so that it remains centered on the form, expands to fill up the form, etc. By inserting code into the event handler for a key press in a text box, the program can automatically translate the case of the text being entered, or even prevent certain characters from being inserted [13].

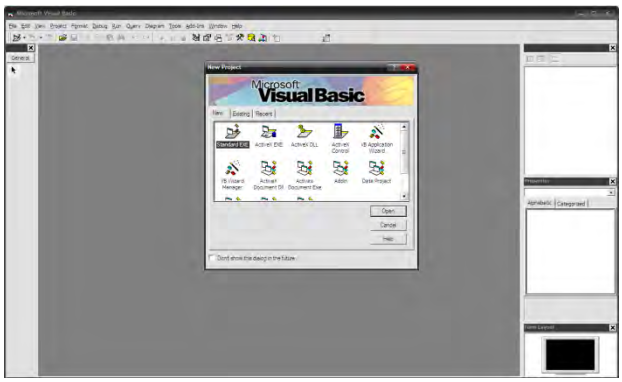

Figure 2.1: Visual Basic

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Interfacing using Visual Basic

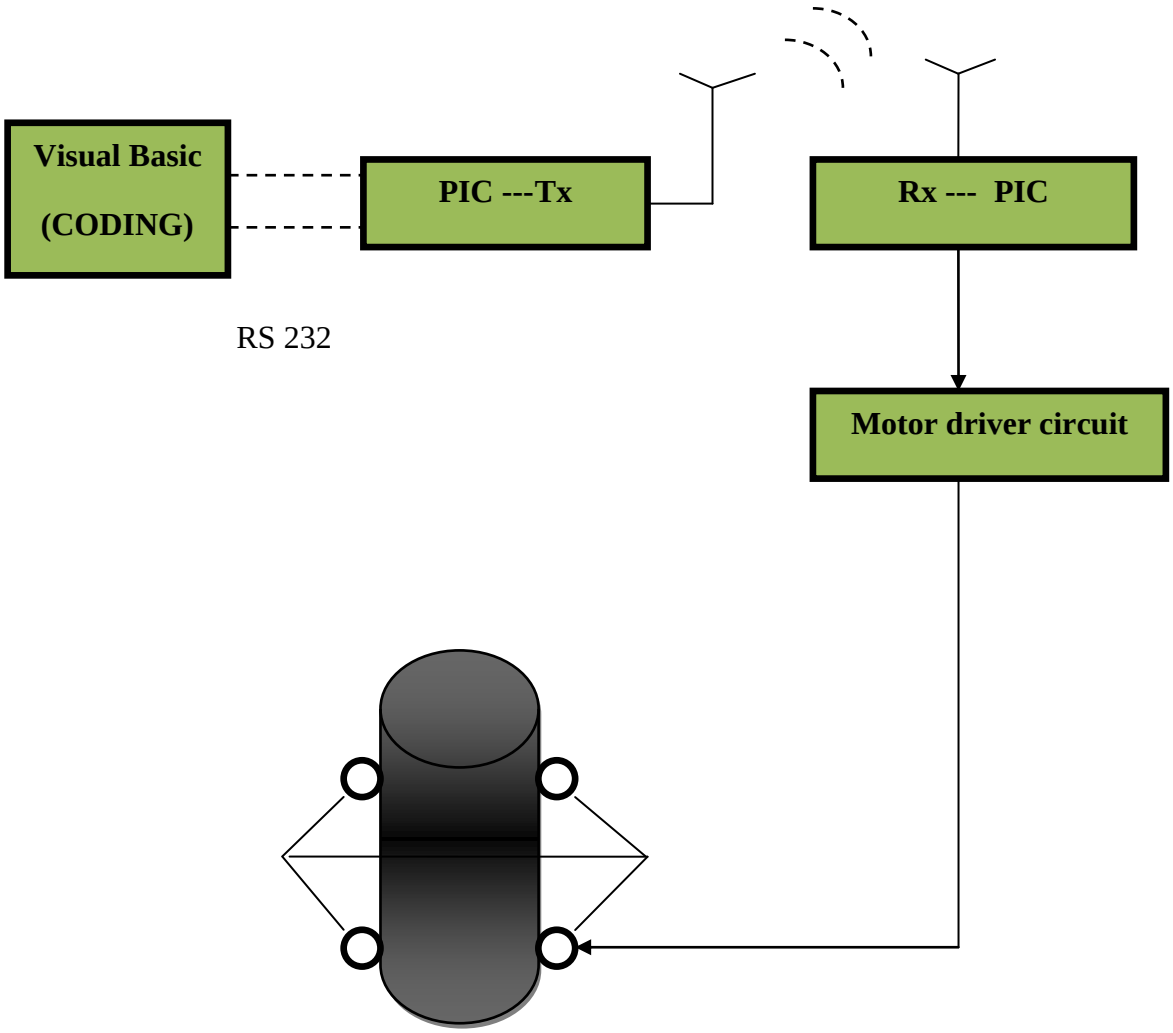

Figure 2.2: Interfacing using Visual Basic

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